



Pinellas Environmental Restoration Project

Semiannual Progress Report for the Young - Rainey STAR Center's 4.5 Acre Site June 2007 Through November 2007

December 2007



U.S. Department
of Energy

Office of Legacy Management

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for the Young – Rainey STAR Center's
4.5 Acre Site**

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Work Performed by S.M. Stoller Corporation under DOE Contract No. DE-AC01-02GJ79491
for the U.S. Department of Energy Office of Legacy Management, Grand Junction, Colorado

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Appendix A Laboratory Reports—September 2007 Semiannual Results

Acronyms and Abbreviations

bls	below land surface
cDCE	cis-1,2-DCE
COPC	contaminants of potential concern
CTL	cleanup target level
DCE	dichloroethene
DOE	U.S. Department of Energy
DPE	dual-phase extraction
EPA	U.S. Environmental Protection Agency
F.A.C.	Florida Administrative Code
FDEP	Florida Department of Environmental Protection
ft	feet
IRA	Interim Remedial Action
µg/L	micrograms per liter
µmhos/cm	micromhos per centimeter
MCL	maximum contaminant level
mg/L	milligrams per liter
mV	millivolts
NGVD	national geodetic vertical datum
NTU	Nephelometric Turbidity Units
QA/QC	quality assurance/quality control
RBCA	Risk-Based Corrective Action
RPD	relative percent difference
STAR Center	Young - Rainey Science, Technology, and Research Center
TCE	trichloroethene
TCOPC	total contaminants of potential concern
VC	vinyl chloride
VOCs	volatile organic compounds

1.0 Introduction

The *Pinellas Environmental Restoration Project Semiannual Progress Report 4.5 Acre Site* describes environmental restoration activities for the Pinellas 4.5 Acre Site located in Pinellas County, Largo, Florida (Figure 1). The former U.S. Department of Energy (DOE) Pinellas Plant facility consisted of the 4.5 Acre Site and the Young - Rainey Science, Technology, and Research Center (STAR Center) (Figure 2). The facility was constructed in the mid-1950s as part of a nationwide nuclear weapons research, development, and production complex. Production of weapons-related components ceased in September 1994. However, as a result of these operations, contamination exists in the surficial groundwater beneath the site.

Administration of DOE activities at the 4.5 Acre Site is the responsibility of the DOE Office of Legacy Management in Grand Junction, Colorado. S.M. Stoller Corporation (Stoller), a prime contractor to DOE's Office of Legacy Management, provides technical support to DOE for the remediation and closure of all active solid-waste management units on site and for the 4.5 Acre Site.

The 4.5 Acre Site is located to the northwest of the STAR Center, in the northeast quarter of Section 13, Township 30 South, Range 15 East (Figure 1). DOE owned this parcel from 1957 to 1972, at which time it was sold to a private landowner. During the period of DOE ownership, the property was used for disposal of drums of waste resins and solvents. As a result of this practice, the surficial aquifer was impacted by volatile organic compounds (VOCs), primarily vinyl chloride (VC), toluene, trichloroethene (TCE), and 1,2-dichloroethene (DCE). DOE completed a source removal in 1985.

An Interim Remedial Action (IRA) consisting of groundwater extraction and treatment via air stripping, and a routine groundwater monitoring program were initiated in May 1990. In July 1997, a modification of the IRA, involving the installation of dual-phase extraction (DPE) wells, provided a more aggressive system to remove groundwater contamination. In November 1999, the DPE/air-stripping system was replaced with an in-situ biosparge treatment system.

The *4.5 Acre Site Biosparge System Integration Plan* (DOE 2000) was approved by the Florida Department of Environmental Protection (FDEP) on January 17, 2001. This plan states that performance monitoring would be undertaken on a quarterly basis. Therefore, in April 2001, performance monitoring of the remedial system through the use of direct push technology was undertaken. However, the biosparge systems were shut off in May 2003 with no plans to restart them and no performance monitoring data have been collected since April 2003. Subsequent monitoring was then adapted to fit the new remediation scenario and performance monitoring as defined in the *Interim Remedial Action Plan for Ground Water Recovery at the 4.5 Acre Site* (DOE 2003b).

The IRA Plan for Ground Water Recovery at the 4.5 Acre Site was submitted to FDEP on August 29, 2003, and approved by FDEP on September 19, 2003. Implementation of the IRA Plan commenced on March 8, 2004, when construction activities began on the IRA treatment system. The treatment system consisted of an extraction well field (three recovery wells), pumps and associated piping, a transmission water pipeline, a utility connection, a low profile tray air stripper unit, and effluent piping. The new IRA system began operations on April 26, 2004.

The IRA system was a temporary measure that was outlined in the *Remedial Action Plan for the Pinellas 4.5 Acre Site* (DOE 2001) as a contingency option in the event that biosparging resulted in extending the contaminant plume. In April 2005, the *Pinellas Environmental Restoration Project 4.5 Acre Site Remedial Action Plan Addendum* (DOE 2005) was submitted to FDEP. This document presented a proposed final action for the 4.5 Acre Site that involves the closure of the site using the provisions of the recently adopted State of Florida Global Risk-Based Corrective Action (RBCA) regulations.

Technical discussions between FDEP and DOE regarding the proposed final action continue. Part of DOE's proposed final action for the 4.5 Acre Site was to shut down the IRA system and begin a 2-year monitoring period. Approval from FDEP to shut down the IRA system was received on December 20, 2005, thus commencing the DOE's 2-year monitoring period.

Although DOE has conducted numerous remediation activities at the 4.5 Acre Site since 1985, FDEP has recently suggested that, based on elevated levels of VOCs in groundwater, a source of VOCs may remain in the subsurface, and that removal of contaminated soil may be necessary (FDEP 2005). To investigate this concern, 1,172 soil samples were collected from 138 soil borings installed at two areas of the site during the summer of 2007. Analytical results demonstrated that the following contaminants were present in site sediments at concentrations that likely represent a source of contamination to groundwater: TCE; cis-1,2-DCE; trans-1,2-DCE; and toluene. Results from this characterization effort can be found in the *4.5 Acre Site Source Characterization Data Report* (DOE 2007).

DOE is currently preparing a feasibility study that evaluates the various treatment technologies that can be used to remediate the source areas identified in the October 2007 report. Once the treatment technology identified in the feasibility study has been approved by FDEP, implementation of the feasibility study can begin. At this time, the source area treatment technology implementation is scheduled to begin in September 2008.

This document is the semiannual progress report for the 4.5 Acre Site for June 2007 through November 2007, as requested by FDEP. The results of monitoring activities and a summary of ongoing and projected work are provided in this report.

1.1 Site Activities

- Obtained water-level measurements from all monitoring wells on September 11, 2007.
- Conducted the semiannual sampling event (i.e., collected groundwater samples from 41 monitoring wells in September 2007.) Forty-one wells were sampled for VOCs and analyzed using U.S. Environmental Protection Agency (EPA) SW-846 Method 8260. Two wells were sampled for arsenic and analyzed using EPA SW-846 Method 6010.
- Reported the results of the semiannual sampling event (this document).

2.0 Monitoring Data

2.1 Groundwater Elevations and Flow

On June 8, 2007, and September 11, 2007, depth-to-water measurements were taken in all monitoring wells and former recovery wells at the 4.5 Acre Site. The depth to water in each well was measured with an electronic water-level indicator. The June and September groundwater elevation data are listed in Table 1. Surface water elevations for Pond 5 (southeast of the 4.5 Acre Site), the West Pond (east), and the pond immediately north of the 4.5 Acre Site are listed in Table 2. The water elevation data were used to construct contours of water levels in the shallow and deep portions of the surficial aquifer for June (Figure 3 and Figure 4, respectively) and September (Figure 5 and Figure 6).

These interpretative contours show that the water table was about 0.5 feet (ft) higher in September 2007 than in June 2007. Groundwater in the shallow surficial aquifer generally flows to the west. However, in both June and September, the surface water elevation in the pond immediately north of the 4.5 Acre Site was higher than the water table elevation in the north part of the site, indicating that there is also a component of flow toward the south (onto the 4.5 Acre Site) from the pond. Groundwater in the deep surficial aquifer flows to the west-northwest.

The average hydraulic gradient across the site was approximately 0.002 feet per foot in June and September 2007. This gradient is the same as that observed the previous year at the site. Calculations using Darcy's Law along with approximations of 1 ft/day for hydraulic conductivity and 0.3 for effective porosity indicate that groundwater at the site is estimated to move about 2 to 3 ft/year. This velocity is on the low end of previously observed velocities of 2 to 10 ft/year.

2.2 Groundwater Sampling

Groundwater samples were collected from 41 monitoring wells at the 4.5 Acre Site in September 2007. Samples from all 41 wells were analyzed for VOCs and samples from 2 wells were analyzed for arsenic.

All samples were collected in accordance with the Stoller *Sampling Procedures for the Young - Rainey STAR Center and 4.5 Acre Site* (DOE 2006a), using FDEP procedures. All samples were submitted to TestAmerica, Tampa, Florida for analysis. TestAmerica in Tampa, Florida, is accredited by the Florida Department of Health in accordance with the National Environmental Laboratory Accreditation Conference, certification number E84282. VOCs were analyzed using EPA method SW-846 8260B. Arsenic was analyzed using EPA method SW-846 6010B. All monitoring wells were micropurged using a dedicated bladder pump, and sampling was performed when the field measurements stabilized. Table 5 lists field measurements of pH, specific conductance, dissolved oxygen, oxidation-reduction potential, turbidity, and temperature recorded at the time the samples were collected. Measurements were made with a flow cell and a multiparameter instrument.

2.3 Groundwater Analytical Results

Table 4 presents individual contaminants of potential concern (COPC) and total COPCs (TCOPCs) concentrations in samples collected from wells at the 4.5 Acre Site. The previous two semiannual results are included in Table 4 for comparison. Arsenic data are shown in Table 5. Figure 7 shows the TCOPCs concentrations for September 2007.

The maximum TCOPCs value detected in September was 3,220 micrograms per liter ($\mu\text{g/L}$) at PIN20–M001. The compound detected at the highest concentration in PIN20–M001 was VC at a concentration of 2,200 $\mu\text{g/L}$.

Laboratory reports for semiannual samples collected in September 2007 are provided in Appendix A.

2.4 Quality Assurance/Quality Control

The results from the analytical laboratory, TestAmerica, were checked for quality assurance/quality control (QA/QC) through duplicate samples and trip blanks. Detected analytes for each duplicate sample collected from the 4.5 Acre Site are listed in Table 5. The duplicate sample results were compared and the relative percent differences (RPDs) between the results were calculated. Sample PIN20–M060 had RPD values of 113 percent and 77 percent for cis-1,2-DCE and trans-1,2-DCE, respectively. Sample PIN20–MWL4 had an RPD value of 41 percent for TCE. Sample PIN12–0524 had an RPD value of 57 percent for 1,1-DCE and sample PIN15–0568 had an RPD value of 63 percent for aluminum. There is no evidence of laboratory errors that would result in high RPD values. The low precision may be attributable to variations in sample collection and sample handling. All other data passed QA/QC criteria at a Class A level, indicating that the data may be used for quantitative and qualitative purposes.

As specified in *Sampling Procedures for the Young - Rainey STAR Center and 4.5 Acre Site* (DOE 2006), duplicate samples should be collected at a frequency of one duplicate for every 20 or fewer samples. For the STAR Center and the 4.5 Acre Site, there were 160 groundwater samples collected, with 8 duplicate samples collected. The duplicate requirements for this sampling event were met. There were 10 trip blanks collected during this event. All trip blank results were negative.

A data validation software module for identifying and tracking anomalous groundwater data points within the SeePRO database was used to generate a report of analytical results that fall outside of historical minimum or maximum values. The results for well PIN20–M063 appear anomalous due to a significant decrease in the concentrations of all analytes. For example, March 2007 to September 2007, TCE concentrations decreased from 800 $\mu\text{g/L}$ to 7 $\mu\text{g/L}$, cDCE decreased from 5,400 $\mu\text{g/L}$ to 150 $\mu\text{g/L}$, and VC decreased from 2,900 $\mu\text{g/L}$ to 160 $\mu\text{g/L}$. One possible explanation for these decreases include a change in groundwater flow or soil contaminant concentrations due to the large number of soil borings that were installed near this well during the summer of 2007. Concentration decreases were observed in a few other wells at the 4.5 Acre Site, but these were not as significant as those observed in M063. Another possible explanation is a sample handling problem. The results for this well will be tracked to determine if the September 2007 results are truly anomalous.

3.0 Data Interpretation

This data interpretation section is included to aid in evaluating plume stability. This section consists of plots showing contaminant concentration trends (Section 3.1), plume maps (Section 3.2), and a discussion of site geochemistry (Section 3.3).

While most of the previous documents for the 4.5 Acre Site have compared groundwater contaminant concentrations to drinking water standards (i.e., maximum contaminant levels [MCLs]), those standards are not the applicable default Cleanup Target Levels (CTLs) for the purposes of evaluating site remediation under RBCA. Based on a comprehensive review of background data for the site (DOE 2003a), it was determined that the shallow groundwater in the site vicinity is naturally elevated in aluminum and iron at levels far exceeding State of Florida Secondary Drinking Water Standards (Chapter 62-550, Florida Administrative Code [F.A.C.]). Specifically, the average background concentration of 1.1 milligrams/liter (mg/L) for aluminum exceeds the 0.2 mg/L secondary standard, and the average background concentration for iron of 9.3 mg/L exceeds the 0.3 mg/L secondary standard. The ambient shallow groundwater in the area is, therefore, designated as “poor quality” as defined in 62-780.200 (35), F.A.C. Thus, the applicable groundwater CTLs are those for groundwater of “low yield/poor quality” provided in Table 1 of Chapter 62-777, F.A.C. In essence, these CTL values are a factor of 10 higher than the MCL values.

3.1 Contaminant Concentration Trends

Figure 8 and Figure 9 show the cDCE and VC concentration trends in wells PIN20–0502 and –M001, respectively. These two wells, located hydraulically downgradient from the area of highest contaminant concentrations, have shown increasing concentration trends over the last few years. This appears to be a result of past operation of the biosparging system, as described in previous reports. However, it appears that the contaminant concentrations in both wells are now decreasing.

Figure 10 and Figure 11 show TCE, cDCE, and VC concentration trends in wells PIN20–MWL4 and –M063. These two wells are in the area of highest contaminant concentrations on the eastern side of the site. Concentrations in these wells have shown an overall decreasing trend. The contaminant concentrations in well M063 decreased by at least an order of magnitude from March 2007 to September 2007. As discussed in Section 2.4, the values measured in September 2007 may be anomalous; future monitoring will be necessary to determine if this decrease is real.

Figure 12 and Figure 13 show TCE, cDCE, and VC concentration trends in wells PIN20–M060 and –M061. These wells are in the area of elevated contaminant concentrations near the southwest property boundary. The contaminant concentrations in these wells do not show distinct trends, with both wells exhibiting significant increases and decreases over time.

3.2 Geochemical Parameters

Geochemical parameters measured in the field in all wells at the 4.5 Acre Site during September 2007 are summarized in Table 3. Conditions across the site generally are reducing as evidenced by the low values of dissolved oxygen and oxygen reduction potential.

4.0 Tasks to Be Performed Semiannually

The following tasks are scheduled during the next semiannual period (December 2007 through May 2008).

- Semiannual sampling and analysis of groundwater in March 2008.
- Collect water-level measurements in March 2008.

5.0 References

DOE (U.S. Department of Energy), 2000. *4.5 Acre Site Biosparge System Integration Plan*, GJO-2000-182-TAR, MAC-PIN 25.5.1.1, prepared by U.S. Department of Energy, Grand Junction Office, Grand Junction, Colorado, December.

DOE (U.S. Department of Energy), 2001. *Remedial Action Plan for the Pinellas 4.5 Acre Site*, U.S. Department of Energy, Grand Junction Office, Grand Junction, Colorado, July.

DOE (U.S. Department of Energy), 2003a. *Historical Review and Evaluation of Contaminants of Potential Concern*, GJO-2002-359-TAC, February.

DOE (U.S. Department of Energy), 2003b. *Pinellas Environmental Restoration Project Interim Remedial Action Plan for Ground Water Recovery at the 4.5 Acre Site*, GJO-2003-480-TAC, prepared by U.S. Department of Energy, Grand Junction Office, Grand Junction, Colorado, August.

DOE (U.S. Department of Energy), 2005. *Pinellas Environmental Restoration Project 4.5 Acre Site Remedial Action Plan Addendum*, DOE-LM/GJ858-2005, prepared by the U.S. Department of Energy Office of Legacy Management, Grand Junction, Colorado, April.

DOE (U.S. Department of Energy), 2006. *Pinellas Environmental Restoration Project Sampling Procedures for the Young - Rainey STAR Center and 4.5 Acre Site*, DOE-LM/GJ1159-2006, prepared by U.S. Department of Energy Office of Legacy Management, Grand Junction, Colorado, April.

DOE (U.S. Department of Energy), 2007. *4.5 Acre Site Source Characterization Data Report*, DOE-LM/1549-2007, prepared by U.S. Department of Energy Office of Legacy Management, Grand Junction, Colorado, December.

FDEP (Florida Department of Environmental Protection), 2005. Letter from John Armstrong (FDEP) to David Ingle, dated July 7, 2005.

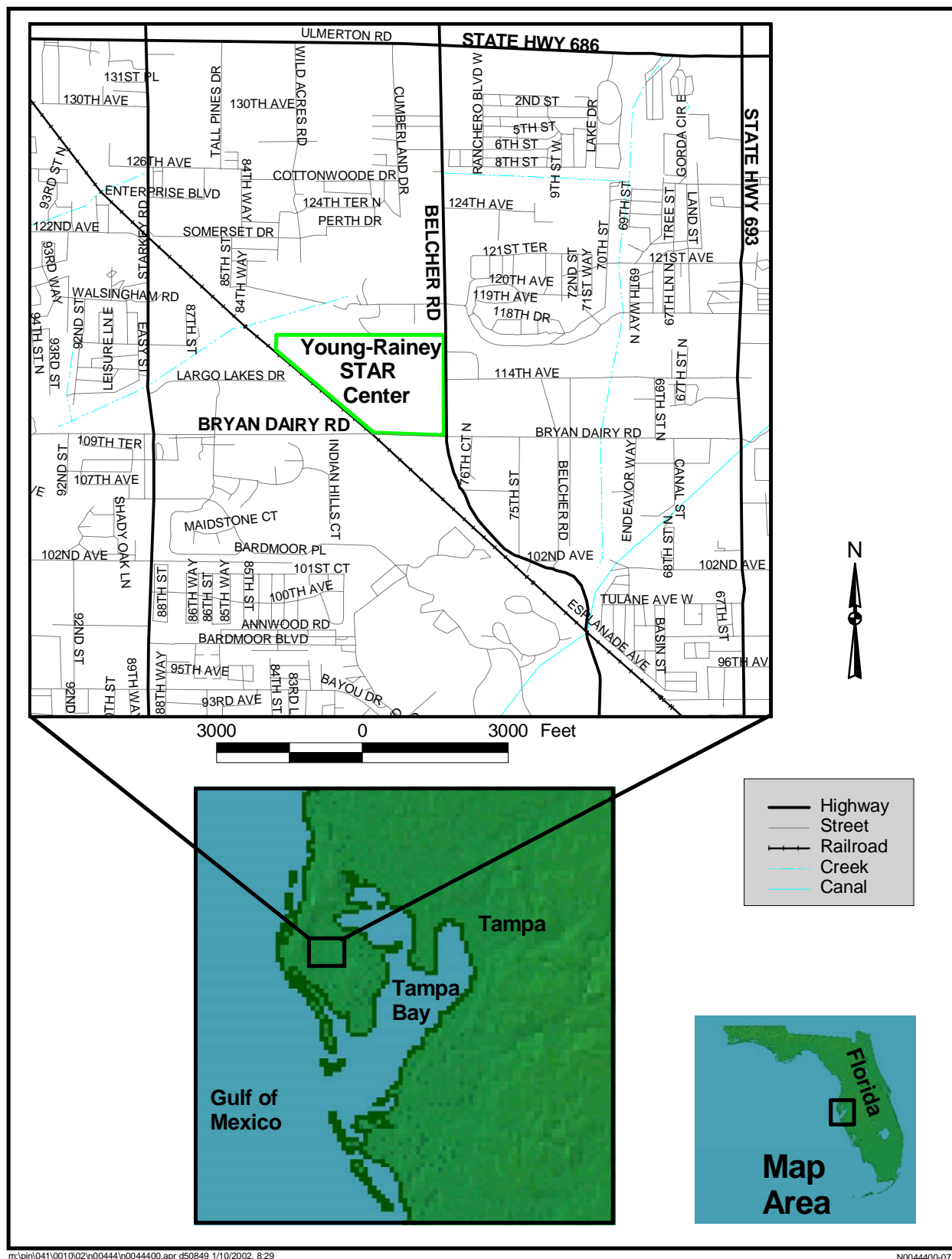
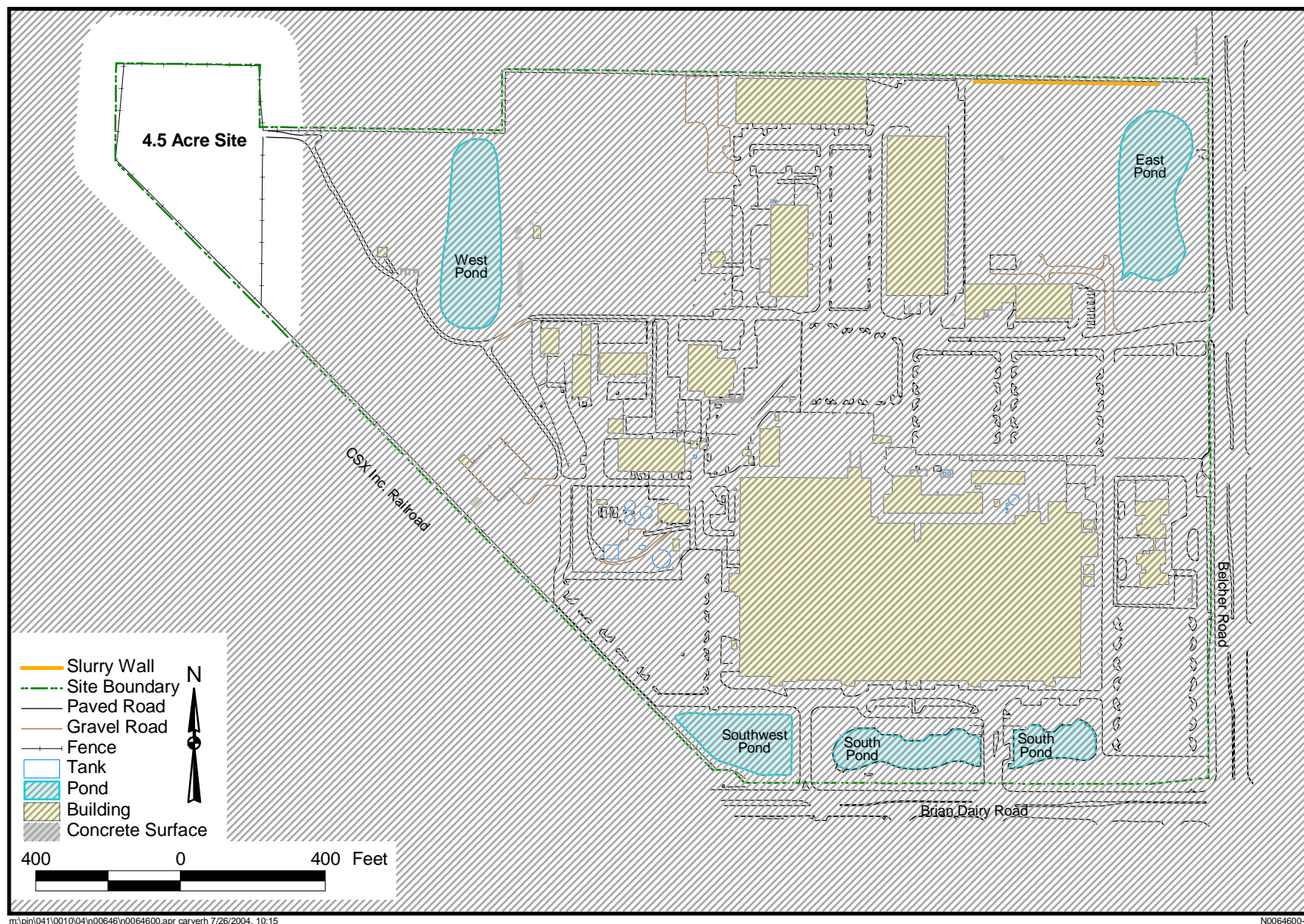
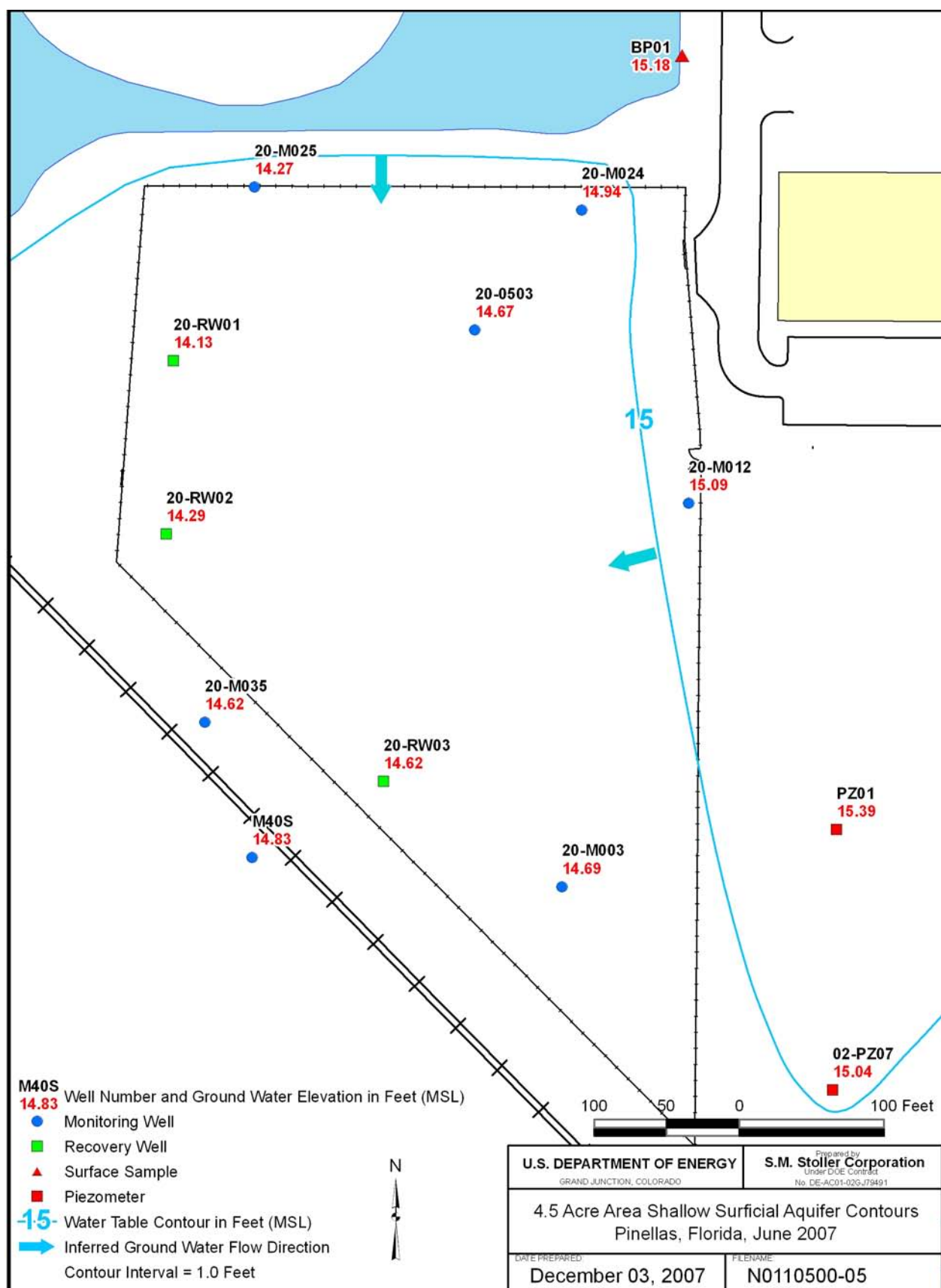


Figure 1. Young - Rainey STAR Center Location



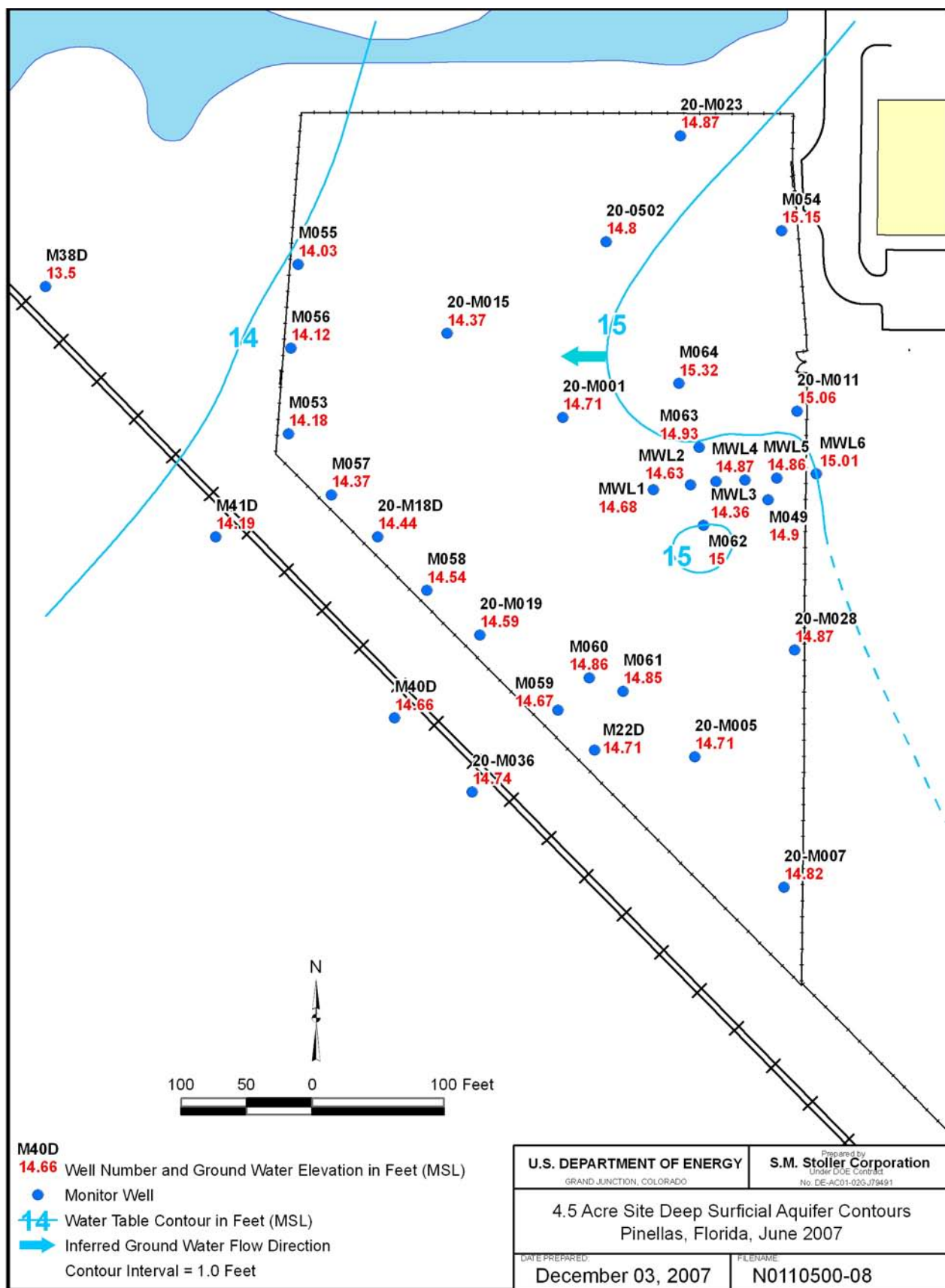
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Figure 2. 4.5 Acre Site Location



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Figure 3. Groundwater Elevations and Shallow Surficial Aquifer Flow, 4.5 Acre Site, June 2007



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Figure 4. Groundwater Elevations and Deep Surficial Aquifer Flow, 4.5 Acre Site, June 2007

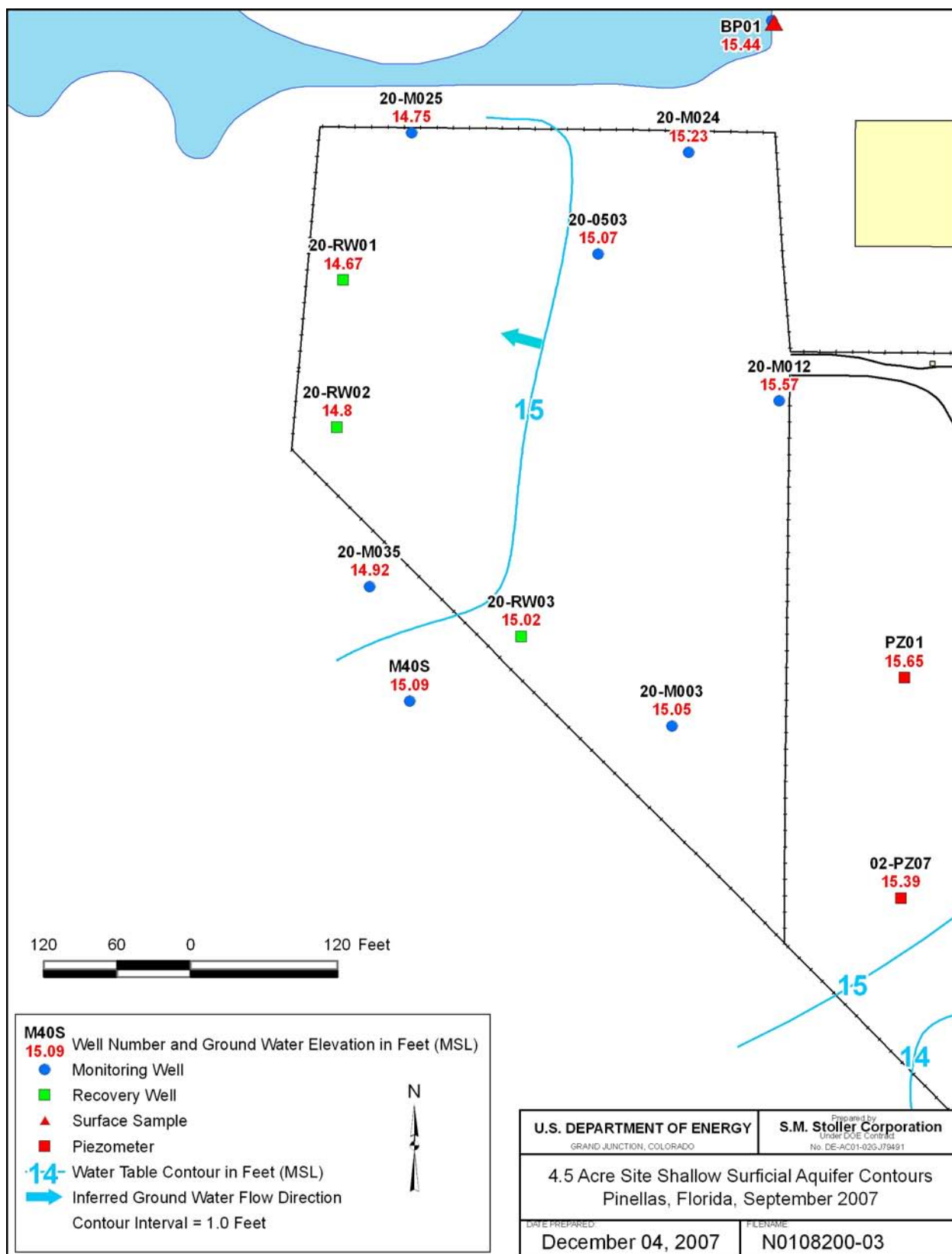
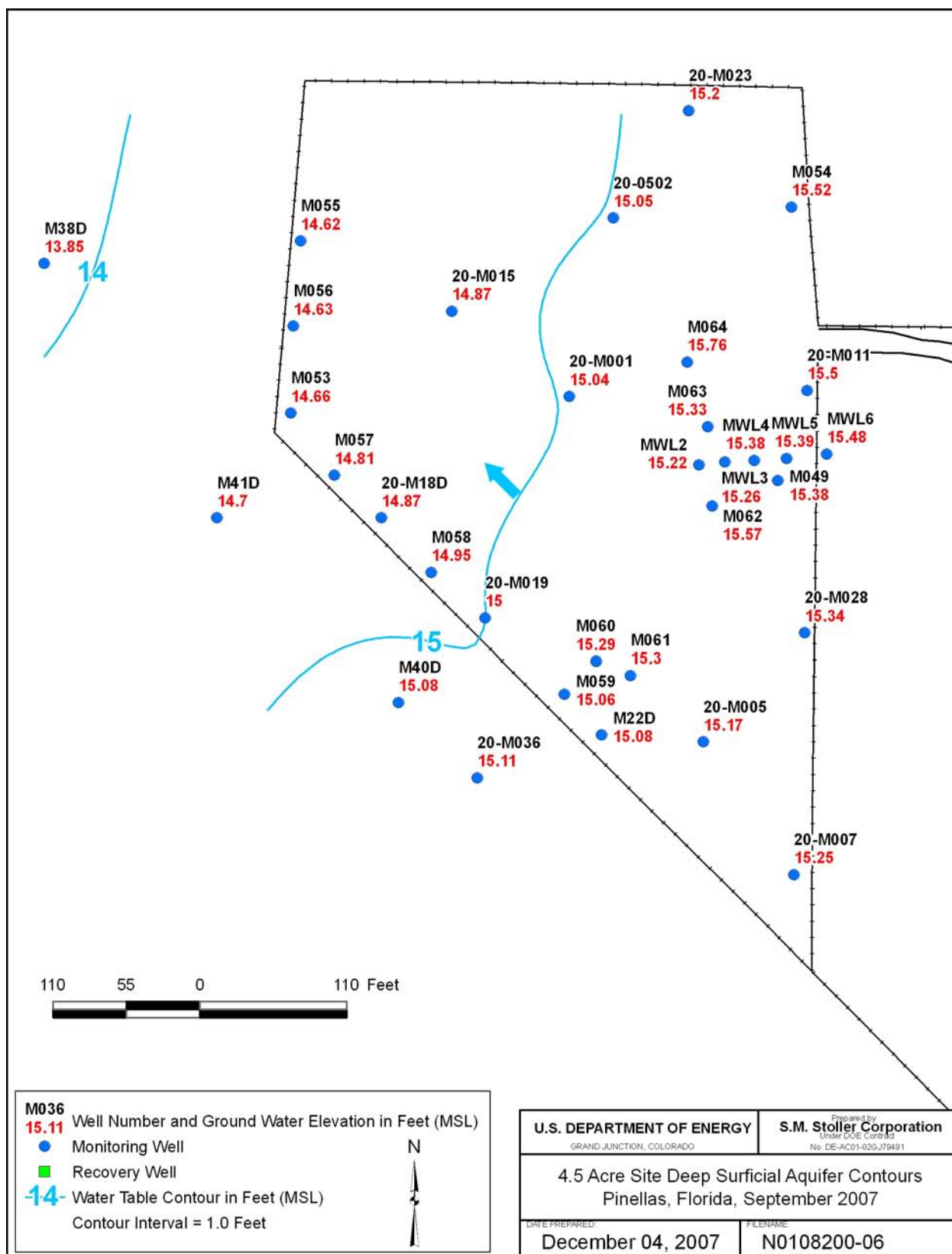


Figure 5. Groundwater Elevations and Shallow Surficial Aquifer Flow, 4.5 Acre Site, September 2007



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Figure 6. Groundwater Elevations and Deep Surficial Aquifer Flow, 4.5 Acre Site, September 2007

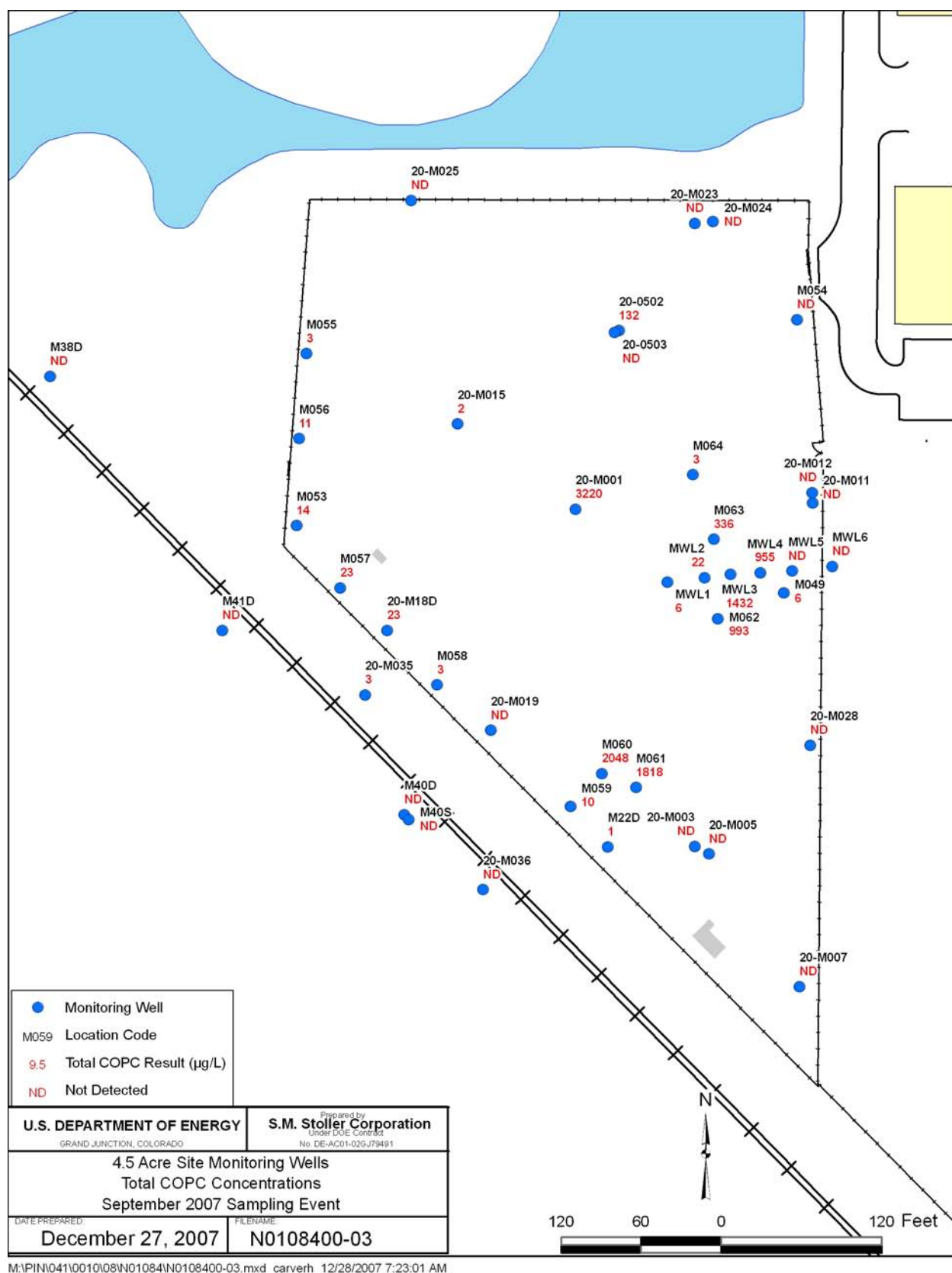


Figure 7. 4.5 Acre Site TCOPC Concentrations September 2007 Sampling Event

cDCE and VC in PIN20-0502

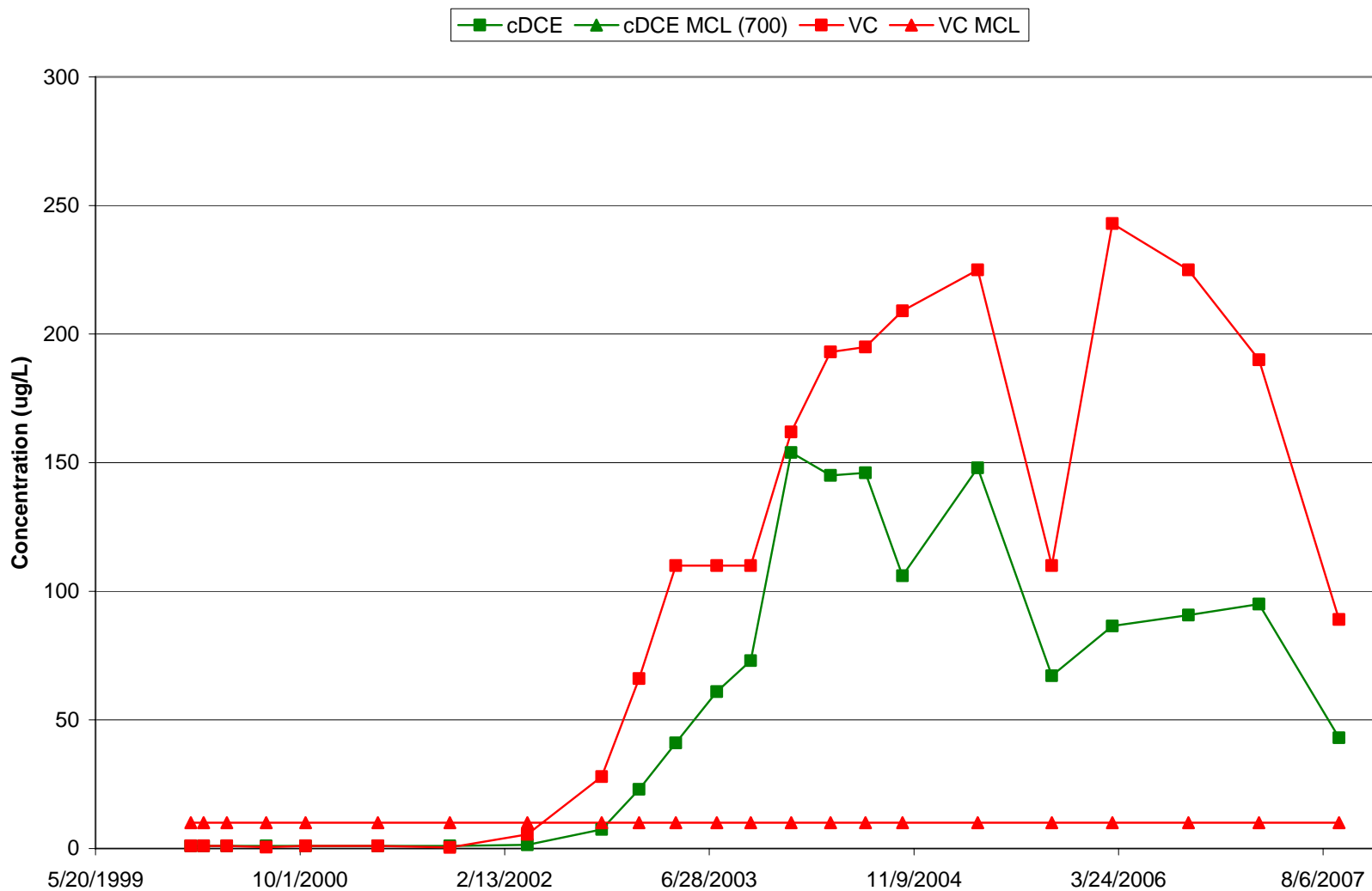


Figure 8. cDCE and VC in PIN20-0502

cDCE and VC in PIN20-M001

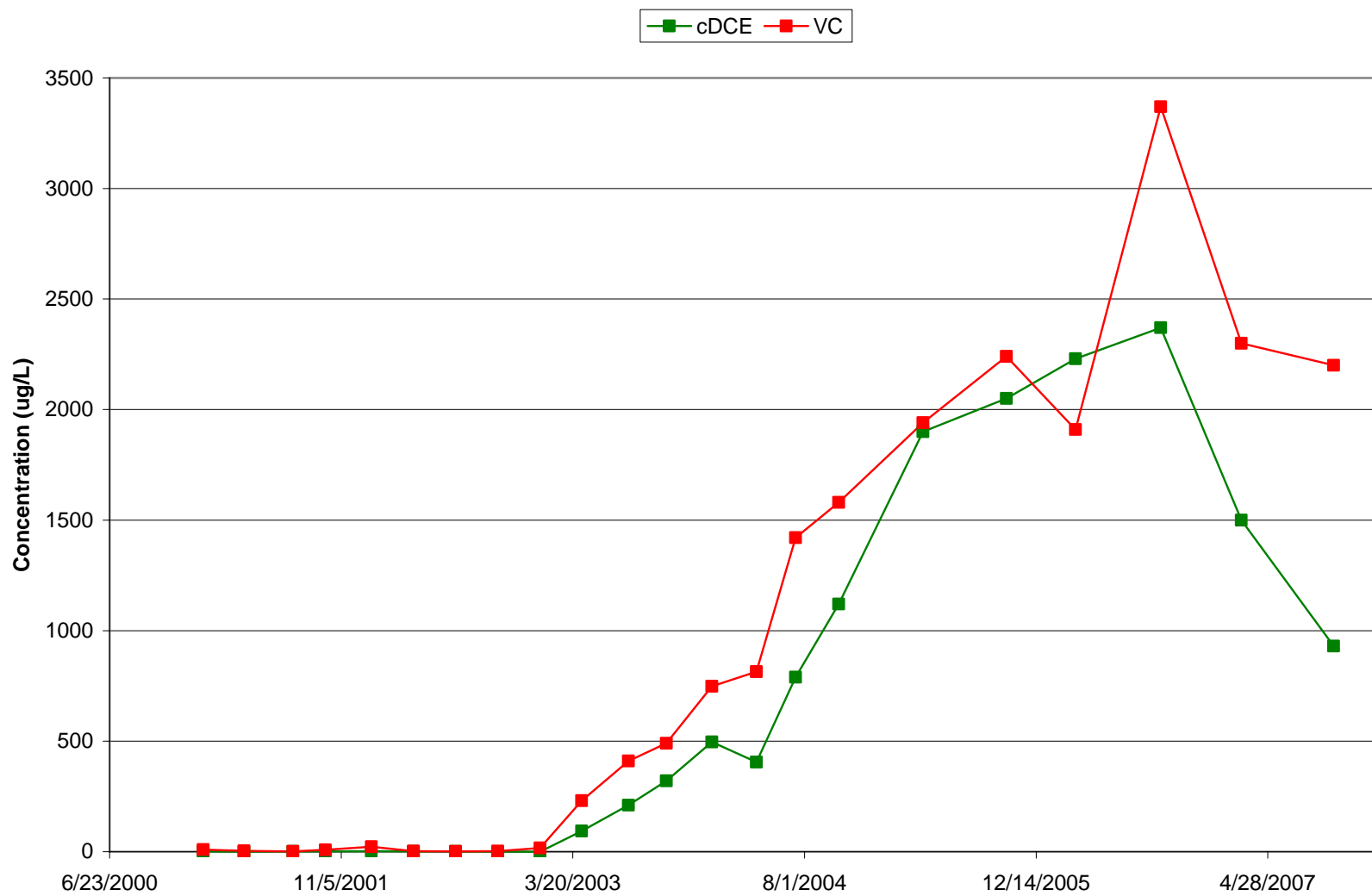


Figure 9. cDCE and VC in PIN20-M001

TCE, cDCE, and VC in PIN20-MWL4

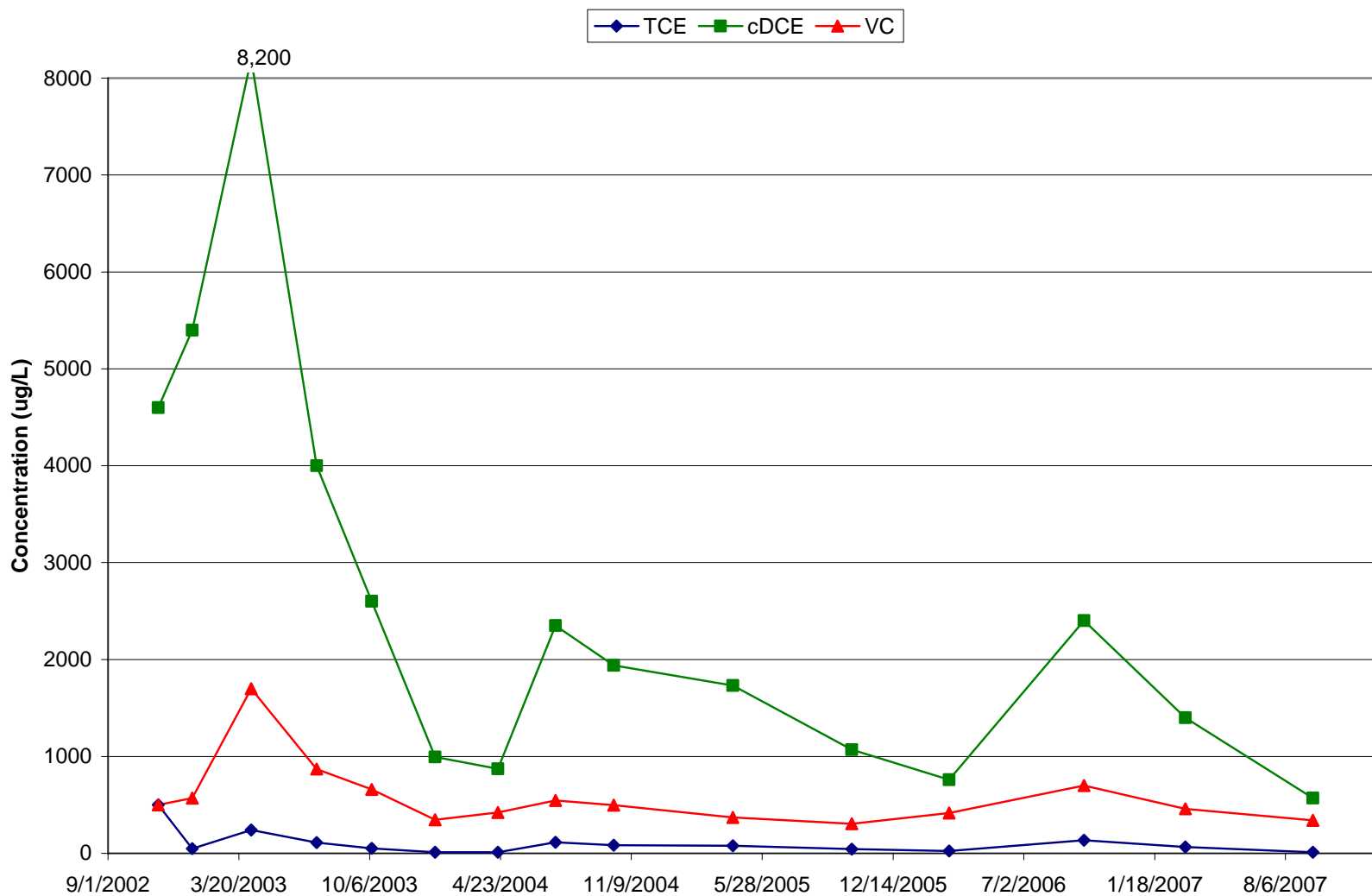


Figure 10. TCE, cDCE, and VC in PIN20-MWL4

TCE, cDCE, and VC in PIN20-M063

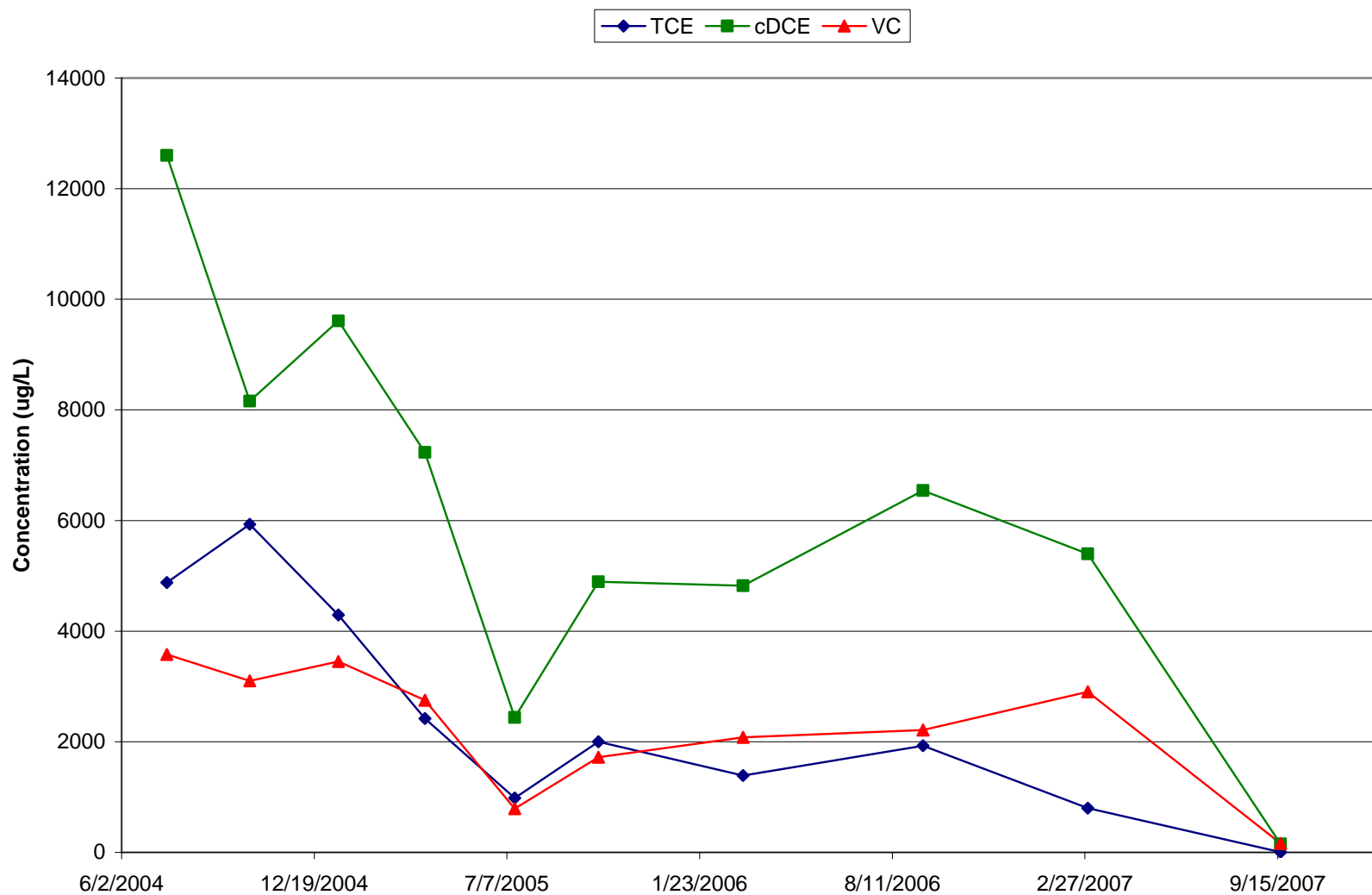


Figure 11. TCE, cDCE, and VC in PIN20-M063

TCE, cDCE, and VC in PIN20-M060

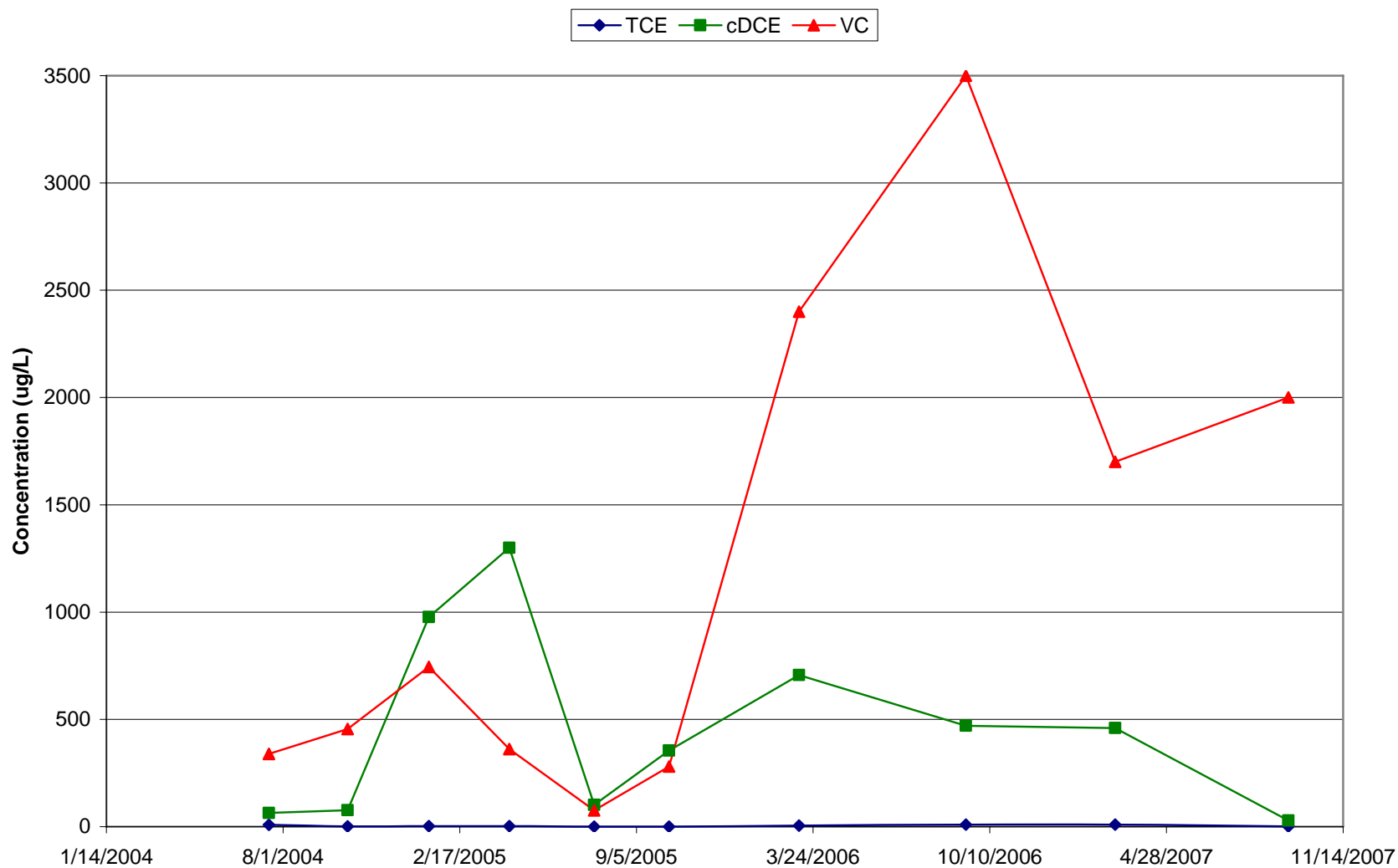


Figure 12. TCE, cDCE, and VC in PIN20-M060

TCE, cDCE, and VC in PIN20-M061

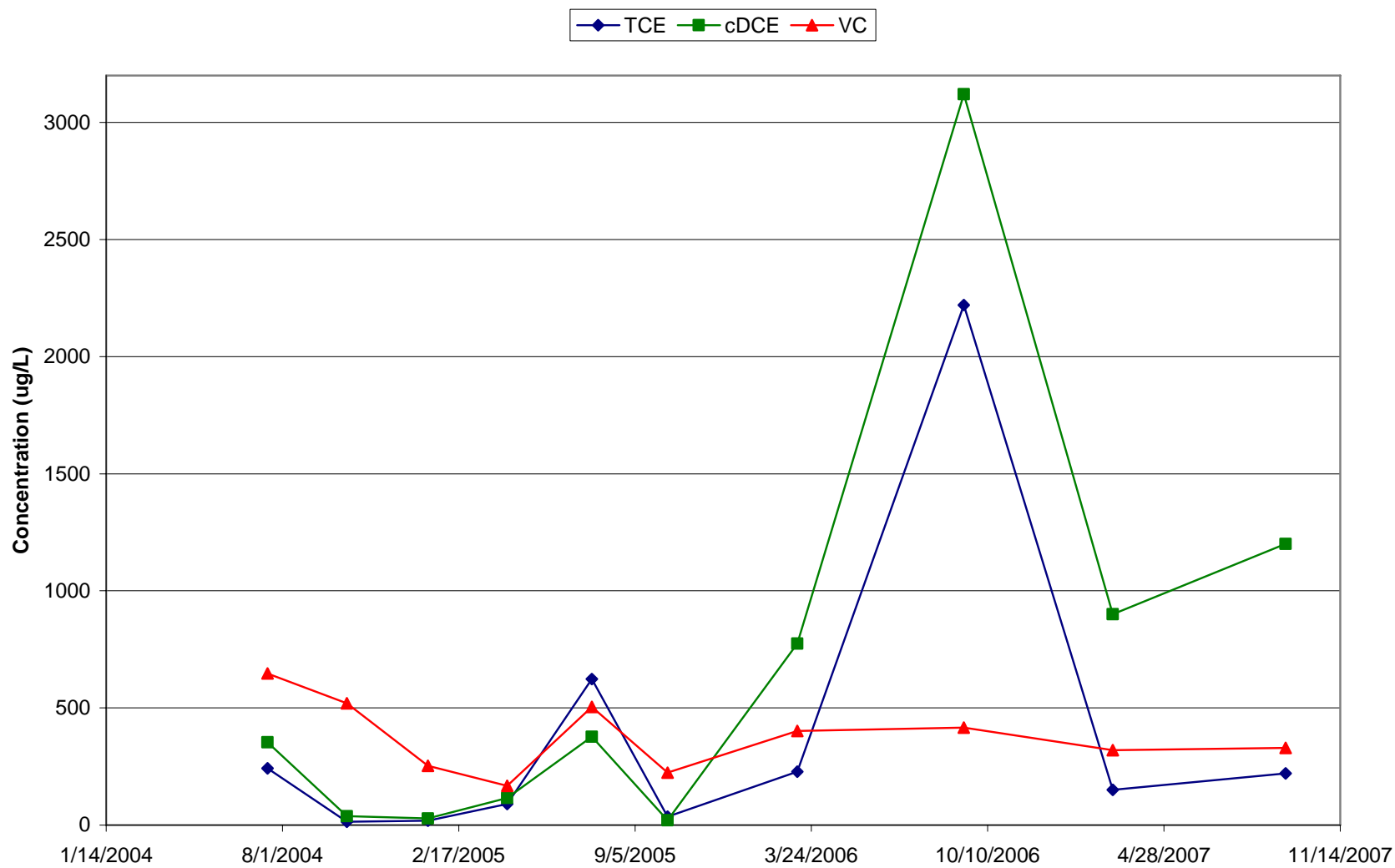


Figure 13. TCE, cDCE, and VC in PIN20-M061

Table 1. Water-Level Data at the 4.5 Acre Site

Location	Measurement		Water Depth From Land Surface (ft)	Ground Water Elevation (ft NGVD)
	Date	Time		
PIN02	Sitewide Piezometers			
PZ01	06/08/07	09:30	2.61	15.39
	09/11/07	10:58	2.35	15.65
PZ07	06/08/07	09:35	2.86	15.04
	09/11/07	11:01	2.51	15.39
PIN20	4.5 Acre Site			
0502	06/08/07	08:23	2.60	14.80
	09/11/07	10:02	2.35	15.05
0503	06/08/07	08:25	2.73	14.67
	09/11/07	10:02	2.33	15.07
M001	06/08/07	09:09	2.89	14.71
	09/11/07	10:00	2.56	15.04
M003	06/08/07	08:46	3.51	14.69
	09/11/07	10:31	3.15	15.05
M005	06/08/07	08:44	3.59	14.71
	09/11/07	10:31	3.13	15.17
M007	06/08/07	08:38	4.63	14.82
	09/11/07	08:55	4.20	15.25
M011	06/08/07	08:30	3.04	15.06
	09/11/07	09:57	2.60	15.50
M012	06/08/07	08:29	2.91	15.09
	09/11/07	09:56	2.43	15.57
M015	06/08/07	09:11	3.13	14.37
	09/11/07	10:12	2.63	14.87
M019	06/08/07	08:32	3.41	14.59
	09/11/07	10:22	3.00	15.00
M023	06/08/07	08:17	4.60	14.87
	09/11/07	10:06	4.27	15.20
M024	06/08/07	08:21	2.86	14.94
	09/11/07	10:05	2.57	15.23
M025	06/08/07	08:15	2.03	14.27
	09/11/07	10:08	1.55	14.75
M028	06/08/07	08:35	3.33	14.87
	09/11/07	08:58	2.86	15.34
M035	06/08/07	08:02	4.18	14.62
	09/11/07	11:26	3.88	14.92
M036	06/08/07	07:58	4.56	14.74
	09/11/07	11:25	4.19	15.11
M049	06/08/07	08:33	2.90	14.90
	09/11/07	09:33	2.42	15.38
M053	06/08/07	08:20	3.02	14.18
	09/11/07	10:17	2.54	14.66
M054	06/08/07	08:27	2.55	15.15
	09/11/07	10:03	2.18	15.52
M055	06/08/07	08:13	3.37	14.03
	09/11/07	10:10	2.78	14.62

Table 1 (continued). Water-Level Data at the 4.5 Acre Site

Location	Measurement		Water Depth From Land Surface (ft)	Ground Water Elevation (ft NGVD)
	Date	Time		
M056	06/08/07	08:18	2.98	14.12
	09/11/07	10:16	2.47	14.63
M057	06/08/07	08:24	3.53	14.37
	09/11/07	10:19	3.09	14.81
M058	06/08/07	08:29	3.16	14.54
	09/11/07	10:21	2.75	14.95
M059	06/08/07	08:36	3.13	14.67
	09/11/07	10:29	2.74	15.06
M060	06/08/07	08:50	2.47	14.86
	09/11/07	10:26	2.04	15.29
M061	06/08/07	08:47	2.43	14.85
	09/11/07	10:27	1.98	15.30
M062	06/08/07	09:01	2.83	15.00
	09/11/07	09:02	2.26	15.57
M063	06/08/07	09:04	3.17	14.93
	09/11/07	09:30	2.77	15.33
M064	06/08/07	09:06	2.39	15.32
	09/11/07	09:58	1.95	15.76
M18D	06/08/07	08:26	3.26	14.44
	09/11/07	10:20	2.83	14.87
M22D	06/08/07	08:48	3.09	14.71
	09/11/07	10:29	2.72	15.08
M38D	06/08/07	07:56	5.00	13.50
	09/11/07	11:18	4.65	13.85
M40D	06/08/07	08:02	4.74	14.66
	09/11/07	11:24	4.32	15.08
M40S	06/08/07	08:00	4.37	14.83
	09/11/07	11:23	4.11	15.09
M41D	06/08/07	07:59	4.91	14.19
	09/11/07	11:20	4.40	14.70
MWL1	06/08/07	08:52	3.56	14.68
	09/11/07	07:29	3.08	15.16
MWL2	06/08/07	08:54	3.14	14.63
	09/11/07	09:27	2.55	15.22
MWL3	06/08/07	08:56	3.34	14.36
	09/11/07	09:25	2.44	15.26
MWL4	06/08/07	08:58	2.87	14.87
	09/11/07	09:20	2.36	15.38
MWL5	06/08/07	09:00	3.71	14.86
	09/11/07	09:32	3.18	15.39
MWL6	06/08/07	09:21	3.44	15.01
	09/11/07	10:52	2.97	15.48
RW01	06/08/07	08:11	3.47	14.13
	09/11/07	10:11	2.93	14.67
RW02	06/08/07	08:22	2.81	14.29
	09/11/07	10:18	2.30	14.80
RW03	06/08/07	08:34	2.98	14.62
	09/11/07	10:23	2.58	15.02

Table 2. 4.5 Acre Site Surface Water Elevations

Location	Measurement		Water Depth From Land Surface (ft)	Groundwater Elevation (ft NGVD)
	Date	Time		
PIN01	Pond 5			
P501	6/8/2007			13.50
	9/11/2007	14:11		13.46
P502	6/8/2007	13:11		13.74
	9/11/2007	14:12		13.78
PIN02	West Pond			
W005	6/8/2007	09:56		13.71
	9/11/2007	14:18		13.79
PIN20	4.5 Acre Site			
BP01	6/8/2007	10:01		14.16
	9/11/2007	10:47		15.44

Table 3. Field Measurements of Samples Collected at the 4.5 Acre Site

Location	Screen Depth (ft bis)	Temperature (°C)	Specific Conductance (µmhos/cm) ^a	Turbidity (NTU)	pH	Oxidation Reduction Potential (mV)	Dissolved Oxygen (mg/L)
PIN20	4.5 Acre Site						
0502	21.2–31.2	27	1,496	14.1	6.44	-57	0.65
0503	13.2–23.2	27.2	1,516	30	6.41	-48.1	1.35
M001	20–25	27.78	1,491	15	6.7	-100.5	0.29
M003	9–14	28.08	1,050	2.8	6.8	-16.2	0.32
M005	25.8–30.7	26.65	1,225	2.9	6.5	-76.8	0.47
M007	25.3–30.3	25.45	1,420	1.3	6.83	-86.3	0.73
M011	23.7–28.7	26.03	880	4.6	6.84	-108.3	0.54
M012	8.6–13.6	27.17	741	6.8	6.73	-53.3	0.44
M015	20.8–25.8	26.72	1,208	3.6	6.8	-99.3	0.33
M019	22–27	27.36	2,339	18	6.52	-79.4	0.89
M023	19.8–24.8	25.7	1,010	33	6.56	-92.5	1.22
M024	8.7–13.7	26.8	885	7	6.49	-69.4	1.28
M025	8.6–13.6	26.15	2,192	14	6.72	-98.3	0.3
M028	22–27	26.11	871	2.8	6.76	-138	0.4
M035	9–14	26.04	2,357	9.3	6.85	-103.9	0.41
M036	25–30	26.45	799	1.9	6.94	-102.3	0.36
M049	20–30	25.76	1,006	400	6.85	-127.5	0.31
M053	20–30	25.59	1,454	9.7	6.55	-105.1	0.51
M054	20–30	26.4	1,178	14	6.47	-99.2	0.4
M055	21–31	26.14	1,292	22	6.96	-95.1	0.22
M056	19–29	25.8	1,547	9.4	6.48	-115.5	0.54
M057	20–30	25.6	1,696	2.9	6.53	-111.1	0.46
M058	18–28	25.8	2,206	33	6.58	-112.1	0.31
M059	19–29	25.22	1,237	19	6.58	-86.1	0.47
M060	18–28	26.7	848	43	6.94	-202.1	0.33
M061	20–30	26.32	1,332	15.3	6.86	-114.9	0.32
M062	20–30	25.62	1,873	80	6.48	-82.2	0.28
M063	19.5–29.5	25.3	2,215	45	6.08	-94.3	0.44
M064	15–25	27.65	3,186	130	6.29	-74.9	1.16
M18D	20–30	26.19	1,867	18	6.6	-106.5	0.35
M22D	20–30	25.18	1,177	11	6.8	-87.5	0.51
M38D	20–30	25.73	829	2.1	6.98	-101	0.65
M40D	18–28	26.07	1,273	8.3	6.93	-135.2	0.3
M40S	4–14	28.01	229	6.1	6.38	64.9	1
M41D	16–26	25.44	2,016	8.9	6.83	-110	0.44
MWL1	21–26	25.94	2,256	9.4	6.16	-97.2	0.55
MWL2	21–26	28.33	2,617	11	6.52	-88.4	0.41
MWL3	21–26	26.48	1,725	5.2	6.51	-106.7	0.78
MWL4	20.8–25.8	26.35	853	6.8	6.85	-101.9	0.35
MWL5	20.8–25.8	26.68	821	4.8	6.83	-113.4	0.92
MWL6	21.5–26.5	26.7	593	6.1	6.87	-65.6	0.48

*Table 4. COPC Concentrations from Wells at the 4.5 Acre Site^a
(reported in micrograms per liter)*

Location	Screen Depth (ft)	Date Sampled	TCE	cis-1,2-DCE	trans-1,2-DCE	Total 1,2-DCE ^b	Vinyl chloride	Benzene	TCOPC ^c
FDEP MCL			3	70	100	63	1	1	
PIN20	4.5 Acre Site								
0502	21.2–31.2	9/11/06	<0.5	90.8	1.3	92.1	225	<0.5	317.1
		3/2/07	<0.5	95	1.5	96.5	190	<0.5	286.5
		9/14/07	<0.5	43	<0.44	43	89	<0.5	132
0503	13.2–23.2	9/19/06	<0.5	<0.5	<0.5	ND	0.77J	<0.5	ND
		3/2/07	<0.5	<0.65	<0.44	ND	<0.5	<0.5	ND
		9/14/07	<0.5	<0.65	<0.44	ND	<0.5	<0.5	ND
M001	20–25	9/9/06	<0.5	2,370	229	2,599	3,370	3.5	5,972.5
		3/2/07	<2.5	1,500	160	1,660	2,300	<2.5	3,960
		9/17/07	<2.5	930	90	1,020	2,200	<2.5	3,220
M003	9–14	3/1/07	<0.5	<0.65	<0.44	ND	<0.5	<0.5	ND
		9/12/07	<0.5	<0.65	<0.44	ND	<0.5	<0.5	ND
M005	25.8–30.7	3/1/07	<0.5	<0.65	<0.44	ND	<0.5	<0.5	ND
		9/12/07	<0.5	<0.65	<0.44	ND	<0.5	<0.5	ND
M007	25.3–30.3	3/1/07	<0.5	<0.65	<0.44	ND	<0.5	<0.5	ND
		9/13/07	<0.5	<0.65	<0.44	ND	<0.5	<0.5	ND
M011	23.7–28.7	9/20/06	<0.5	<0.5	<0.5	ND	<0.5	<0.5	ND
		3/2/07	<0.5	<0.65	<0.44	ND	<0.5	<0.5	ND
		9/17/07	<0.5	<0.65	<0.44	ND	<0.5	<0.5	ND
M012	8.6–13.6	9/20/06	<0.5	<0.5	<0.5	ND	<0.5	<0.5	ND
		3/2/07	<0.5	<0.65	<0.44	ND	<0.5	<0.5	ND
		9/17/07	<0.5	<0.65	<0.44	ND	<0.5	<0.5	ND
M015	20.8–25.8	10/2/06	<0.5	<0.5	<0.5	ND	0.69J	<0.5	ND
		3/6/07	<0.5	<0.65	<0.44	ND	<0.5	<0.5	ND
		9/17/07	<0.5	<0.65	<0.44	ND	2.1	<0.5	2.1
M019	22–27	9/19/06	<0.5	0.84J	<0.5	0.84J	0.6J	<0.5	ND
		3/1/07	<0.5	<0.65	<0.44	ND	<0.5	<0.5	ND
		9/12/07	<0.5	<0.65	<0.44	ND	0.81J	<0.5	ND
M023	19.8–24.8	9/12/06	<0.5	<0.5	<0.5	ND	<0.5	<0.5	ND
		3/2/07	<0.5	<0.65	<0.44	ND	<0.5	<0.5	ND
		9/14/07	<0.5	<0.65	<0.44	ND	<0.5	<0.5	ND
M024	8.7–13.7	9/12/06	<0.5	<0.5	<0.5	ND	<0.5	<0.5	ND
		3/2/07	<0.5	<0.65	<0.44	ND	<0.5	<0.5	ND
		9/14/07	<0.5	<0.65	<0.44	ND	<0.5	<0.5	ND
M025	8.6–13.6	9/12/06	<0.5	<0.5	<0.5	ND	<0.5	<0.5	ND
		3/2/07	<0.5	<0.65	<0.44	ND	<0.5	<0.5	ND
		9/17/07	<0.5	<0.65	<0.44	ND	<0.5	<0.5	ND
M028	22–27	9/20/06	<0.5	<0.5	<0.5	ND	<0.5	<0.5	ND
		3/2/07	<0.5	<0.65	<0.44	ND	<0.5	<0.5	ND
		9/13/07	<0.5	<0.65	<0.44	ND	<0.5	<0.5	ND
M035	9–14	9/14/06	<0.5	3.9	<0.5	3.9	<0.5	<0.5	3.9
		3/7/07	<0.5	2.4	0.45J	2.4	<0.5	<0.5	2.4
		9/14/07	<0.5	3.4	<0.44	3.4	<0.5	<0.5	3.4

Table 4 (continued). COPC Concentrations from Wells at the 4.5 Acre Site
(reported in micrograms per liter)

Location	Screen Depth (ft)	Date Sampled	TCE	cis-1,2-DCE	trans-1,2-DCE	Total 1,2-DCE ^b	Vinyl chloride	Benzene	TCOPC ^c
FDEP MCL			3	70	100	63	1	1	
M036	25–30	9/14/06	<0.5	<0.5	<0.5	ND	<0.5	<0.5	ND
		3/7/07	<0.5	<0.65	<0.44	ND	<0.5	<0.5	ND
		9/14/07	<0.5	<0.65	<0.44	ND	<0.5	<0.5	ND
M049	20–30	9/20/06	<0.5	6.2	0.57J	6.2	4	<0.5	10.2
		3/2/07	<0.5	5.1	<0.44	5.1	4.6	<0.5	9.7
		9/13/07	<0.5	3.7	<0.44	3.7	2.3	<0.5	6
M053	20–30	9/19/06	<0.5	2.4	<0.5	2.4	1.4	<0.5	3.8
		3/1/07	<0.5	8.3	<0.44	8.3	1.5	<0.5	9.8
		9/12/07	<0.5	11	<0.44	11	3.4	<0.5	14.4
M054	20–30	3/2/07	<0.5	<0.65	<0.44	ND	<0.5	<0.5	ND
		9/14/07	<0.5	<0.65	<0.44	ND	<0.5	<0.5	ND
M055	21–31	9/12/06	<0.5	2.3	<0.5	2.3	2.7	<0.5	5
		3/2/07	<0.5	2.6	<0.44	2.6	4	<0.5	6.6
		9/17/07	<0.5	<0.65	<0.44	ND	3.2	<0.5	3.2
M056	19–29	9/19/06	<0.5	4.2	<0.5	4.2	2.8	<0.5	7
		3/2/07	<0.5	4.1	<0.44	4.1	3.9	<0.5	8
		9/12/07	<0.5	4	<0.44	4	7.3	<0.5	11.3
M057	20–30	9/13/06	<0.5	14.8	<0.5	14.8	1.9	<0.5	16.7
		3/1/07	<0.5	19	<0.44	19	3.2	<0.5	22.2
		9/12/07	<0.5	18	<0.44	18	5.3	<0.5	23.3
M058	18–28	9/19/06	<0.5	2.2	<0.5	2.2	1.6	<0.5	3.8
		3/1/07	<0.5	1.6	<0.44	1.6	1.7	<0.5	3.3
		9/12/07	<0.5	<0.65	<0.44	ND	3.3	<0.5	3.3
M059	19–29	9/11/06	<0.5	3.7	1	4.7	12	<0.5	16.7
		3/1/07	<0.5	<0.65	<0.44	ND	4.1	<0.5	4.1
		9/12/07	<0.5	<0.65	<0.44	ND	9.5	<0.5	9.5
M060	18–28	9/13/06	<10	470	142	612	3,500	<10	4,112
		3/1/07	9.9	460	100	560	1,700	<2.5	2,269.9
		9/13/07	<1	28	20	48	2,000	<1	2,048
M061	20–30	9/13/06	2,220	3,120	153	3,273	416	<2.5	5,909
		3/1/07	150	900	69	969	320	<1	1,439
		9/13/07	220	1,200	68	1,268	330	<2.5	1,818
M062	20–30	9/12/06	<10	648	<10	648	1,930	<10	2,578
		3/1/07	4.8	300	5	305	600	1.5	911.3
		9/17/07	<0.5	160	3.1	163.1	830	<0.5	993.1
M063	19.5–29.5	9/12/06	1,930	6,540	486	7,026	2,210	<50	11,166
		3/2/07	800	5,400	320	5,720	2,900	<5	9,420
		9/18/07	7	150	19	169	160	<0.5	336
M064	15–25	9/11/06	<0.5	1.2	<0.5	1.2	5.8	<0.5	7
		3/6/07	<0.5	<0.65	<0.44	ND	1.1	<0.5	1.1
		9/17/07	<0.5	<0.65	<0.44	ND	2.7	<0.5	2.7
M18D	20–30	9/19/06	<0.5	14.5	0.65J	14.5	5.8	<0.5	20.3
		3/1/07	<0.5	15	<0.44	15	4.6	<0.5	19.6
		9/12/07	<0.5	13	0.74J	13	10	<0.5	23

*Table 4 (continued). COPC Concentrations from Wells at the 4.5 Acre Site
(reported in micrograms per liter)*

Location	Screen Depth (ft)	Date Sampled	TCE	cis-1,2-DCE	trans-1,2-DCE	Total 1,2-DCE ^b	Vinyl chloride	Benzene	TCOPC ^c
FDEP MCL			3	70	100	63	1	1	
M22D	20–30	9/19/06	<0.5	<0.5	<0.5	ND	0.72J	<0.5	ND
		3/1/07	<0.5	<0.65	<0.44	ND	1.1	<0.5	1.1
		9/13/07	<0.5	<0.65	<0.44	ND	1.4	<0.5	1.4
M38D	20–30	9/14/06	<0.5	<0.5	<0.5	ND	<0.5	<0.5	ND
		3/7/07	<0.5	<0.65	<0.44	ND	<0.5	<0.5	ND
		9/14/07	<0.5	<0.65	<0.44	ND	<0.5	<0.5	ND
M40D	18–28	9/14/06	<0.5	<0.5	<0.5	ND	<0.5	<0.5	ND
		3/7/07	<0.5	<0.65	<0.44	ND	<0.5	<0.5	ND
		9/14/07	<0.5	<0.65	<0.44	ND	<0.5	<0.5	ND
M40S	4–14	9/14/06	<0.5	<0.5	<0.5	ND	<0.5	<0.5	ND
		3/7/07	<0.5	<0.65	<0.44	ND	<0.5	<0.5	ND
		9/14/07	<0.5	<0.65	<0.44	ND	<0.5	<0.5	ND
M41D	16–26	9/14/06	<0.5	<0.5	<0.5	ND	<0.5	<0.5	ND
		3/7/07	<0.5	<0.65	<0.44	ND	<0.5	<0.5	ND
		9/14/07	<0.5	<0.65	<0.44	ND	<0.5	<0.5	ND
MWL1	21–26	9/20/06	<0.5	<0.5	<0.5	ND	5.4	3.1	8.5
		3/6/07	<0.5	<0.65	<0.44	ND	5.5	2.5	8
		9/14/07	<0.5	<0.65	<0.44	ND	4	1.9	5.9
MWL2	21–26	10/2/06	<0.5	1.7	5.7	7.4	19.6	<0.5	27
		3/6/07	<0.5	1.3	2.9	4.2	16	<0.5	20.2
		9/14/07	<0.5	<0.65	2.7	2.7	19	<0.5	21.7
MWL3	21–26	10/2/06	<25	305	<25	305	2,760	<25	3,065
		3/6/07	<0.5	71	6.5	77.5	1,500	<0.5	1,577.5
		9/14/07	<0.5	26	6.5	32.5	1,400	<0.5	1,432.5
MWL4	20.8–25.8	10/2/06	135	2,400	105	2,505	700	<10	3,340
		3/6/07	64	1,400	66	1,466	460	<0.5	1,990
		9/17/07	10	570	35	605	340	<0.5	955
MWL5	20.8–25.8	3/6/07	<0.5	<0.65	<0.44	ND	<0.5	<0.5	ND
		9/13/07	<0.5	<0.65	<0.44	ND	<0.5	<0.5	ND
MWL6	21.5–26.5	10/2/06	<0.5	<0.5	<0.5	ND	<0.5	<0.5	ND
		3/6/07	<0.5	<0.65	<0.44	ND	<0.5	<0.5	ND
		9/17/07	<0.5	<0.65	<0.44	ND	<0.5	<0.5	ND

^a"<" values are reporting limits.

^bTotal 1,2–DCE is the sum of cis–1,2–DCE and trans–1,2–DCE.

^cTCOPC is the sum of the individual COPC concentrations. The cis–1,2–DCE and trans–1,2–DCE values are not part of the TCOPC value because these values are included in the total 1,2–DCE value. "J" values are not included in the TCOPC value.

ND = Not detected.

J = Estimated value, result is between the reporting limit and the method detection limit.

Arsenic, while a COPC, is not included in this table, nor in the TCOPC value.

Table 5. Arsenic Concentrations from Wells at the 4.5 Acre Site

Location	Sample Date	Concentration (mg/L)
0502	9/14/07	<0.0048
0503	9/14/07	0.027

"<" values are method detection limits.

Table 6. RPD for Duplicate Samples, 4.5 Acre Site

Sample ID	Analyte	S	D	RPD	MDL	5xMDL	Fail?
PIN20-M001	cis-1,2-Dichloroethylene	930	770	19	13	65	
PIN20-M001	trans-1,2-Dichloroethylene	90	100	11	0.44	2.2	
PIN20-M001	Vinyl chloride	2,200	1,800	20	10	50	
PIN20-M060	cis-1,2-Dichloroethylene	28	100	113	1.3	6.5	Yes
PIN20-M060	trans-1,2-Dichloroethylene	20	45	77	0.88	4.4	Yes
PIN20-M060	Vinyl chloride	2,000	2,100	5	10	50	
PIN20-MWL4	cis-1,2-Dichloroethylene	570	530	7	3.3	16.5	
PIN20-MWL4	trans-1,2-Dichloroethylene	35	33	6	0.44	2.2	
PIN20-MWL4	Trichloroethylene	10	6.6	41	0.5	2.5	Yes
PIN20-MWL4	Vinyl chloride	340	320	6	2.5	12.5	

S = Original sample (N001), VOC concentrations in µg/L and metals in mg/L.

D = Duplicate sample (N002), VOC concentrations in µg/L and metals in mg/L.

RL = Reporting limit.

Fail = Volatiles "fail" when the RPD is greater than $\pm 30\%$ and the concentration is more than 5 times the reporting limit. Metals "fail" when the samples are more than 5 times the reporting limit and the RPD is greater than 20%. For metals samples that are less than 5 times the reporting limit the difference must be less than \pm the reporting limit (this includes the case when only one of the duplicate/sample values is less than 5 times the reporting limit).

Appendix A

Laboratory Reports—September 2007 Semiannual Results

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